Service Manual

DIRECT DRIVE FULL AUTOMATIC
STEREO TURNTABLE

PL-3000/HB, HE

PIONEER®

MODEL PL-3000 COMES IN FIVE VERSIONS DISTINGUISHED AS FOLLOWS:

Type	Voltage	Remarks
HB	AC 220V and 240V (Switchable)	United Kingdom model (Without AC cord plug)
HE	AC 220V and 240V (Switchable)	Europe model
S	AC 110V, 120V, 220V and 240V (Switchable)	General export model
S/G	AC 110V, 120V, 220V and 240V (Switchable)	U.S. Military model
KU	AC 120V only	U.S.A. model

- **This service manual is applicable to the PL-3000/HB, HE. For servicing of the other types, please refer to the additional service manuals.**

CONTENTS

1. SPECIFICATIONS

Motor and Turntable

Drive System . . . . . .Direct-drive
Motor . . . . . DC servo motor
Turntable Platter. . . 310mm diam. aluminum alloy die-cast
Moment of Inertia. . . . .220kg-cm^2 (including platter mat)
Speeds . . . . . 33-1/3 and 45rpm
Speed Control Range . . . . . .±2%
Wow and Flutter . . . . . Less than 0.03% (WRMS)
Signal-to-Noise Ratio . . . . . .More than 73dB (DIN-B)

Tonearm

Type. . . . . .Static-balance type, S-shaped pipe arm
Effective Arm Length 221mm
Overhang. 15.5mm
Usable Cartridge Weight . . . . . .4g (min.) to 9g (max.)

Subfunctions

Full auto mechanism, Anti-skating force control, Stylus pressure direct-readout counterweight, Strobe light, Free stop hinges

Semiconductors

Transistors 2
Diodes 7
Hall elements 3
IC 1

Miscellaneous

Power Requirements:
PL-3000/HB, HE . . 220/240V~(switchable), 50, 60Hz
Power Consumption 7W
Dimensions . . . . . 384(W) x 145(H) x 360(D) mm
15-1/8(W) x 5-11/16(H) x 14-3/16(D) in.
Weight . . . . . 7.9kg/17 lb 7 oz

PC-150 Specifications

Type. . . . . .Moving magnet type
Stylus . . . . . 0.5 mil diamond (PN-150)
Output Voltage. . . . . .3.5mV (1kHz, 50mm/s Peak velocity, LAT)
Tracking Force . . . . . 1.7g to 2.5g (proper 2.2g)
Frequency Response . . . . . .15 to 30,000Hz

Accessories

EP adaptor 1
Screwdriver 1
Operating instructions (French & German furnished on models for HE) 1

FOR USE IN UNITED KINGDOM

CAUTION 240V: MAINS SUPPLY VOLTAGE IS FACTORY ADJUSTED AT 240 VOLTS.

IMPORTANT

The wires in this mains lead are coloured in accordance with the following code:

Blue:	Neutral
Brown:	Live

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug proceed as follows.
The wire which is coloured blue must be connected to the terminal which is marked with the latter N or coloured black.
The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.
The power cord should be connected last, make sure that the power switch is off.
Unplug the set from the wall socket when it is not be used for an extended period of time.

NOTE:
Specifications and design subject to possible modification without notice, due to improvements.

2. PANEL FACILITIES AND OPERATIONS

SPEED SELECTOR BUTTON

45 . . . . When this button is depressed, the platter will rotate at 45rpm. Depress for playing 45rpm records, singles or EP's.

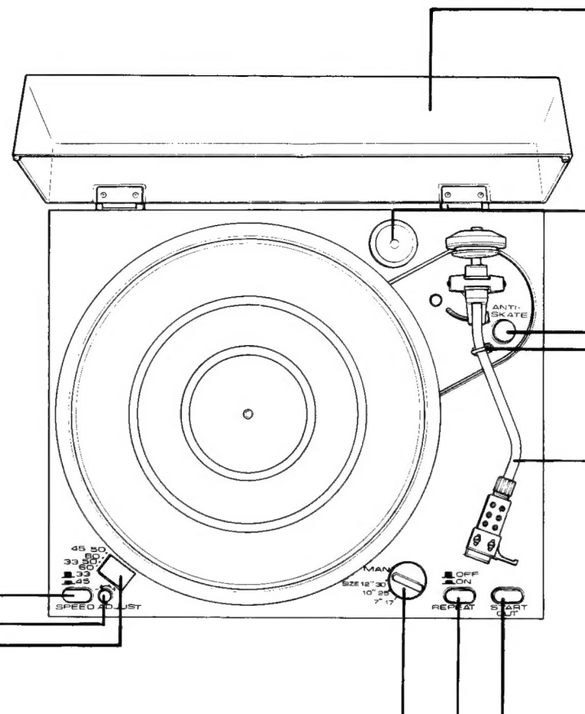
33 . . . . When this button is set to the released position, the platter will rotate at 33-1/3rpm. Release for playing 33-1/3rpm records like LP's.

SPEED ADJUSTMENT KNOB

Turn this knob when delicately adjusting the speed of the platter. The speed of platter will increase when the knob is turned clockwise, in the direction of "+"; it will decrease when turned counterclockwise, in the direction of "–". For detailed instruction, refer to the section "ADJUSTING THE SPEED OF PLATTER".

STROBE LIGHT/SPEED CHECKING WINDOW

The strobe light comes on when the START/CUT button is depressed, and the stroboscope illuminates the design cut around the bottom face of the turntable. The speed of the platter can be checked by observing the movement of markings through the checking window. (Refer to "ADJUSTING THE SPEED OF PLATTER").



DUST COVER

Keep this closed unless operating the controls or tonearm, or changing over records. This serves to keep dust from adhering to the records during record play. When fully opened and pulled straight up, this dust cover can be removed from the cabinet.

EP ADAPTOR/ADAPTOR RETAINER

When playing an EP record, fit this adaptor to the center shaft. When not in use, attach it to the adaptor retainer.

ANTI-SKATE KNOB

This knob is used to cancel out the harmful skating force which is generated during record play.

ARM REST/CLAMPER

The arm rest supports the tonearm when it is not being used. Set the tonearm on its rest when it is not playing records. Clamp it into position if you don't have any immediate plans to play records.

TONEARM

This tonearm is designed to apply the correct tracking force to the cartridge and to keep this force at the precise level for faithful tracking of the record grooves.

RECORD SIZE SELECTOR

This selector selects the size of the record for automatic play and also selects manual play.

7" 17 . . . For the automatic play of 17cm (7-inch) LP and EP records.

10" 25 . . . For the automatic play of 25cm (10-inch) LP records.

12" 30 . . For the automatic play of 30cm (12-inch) LP records.

MAN . . . For the manual play of records.

NOTE:
The tonearm will not be actuated when the RECORD SIZE SELECTOR is at the MANUAL position for play, even if the START/CUT button and the REPEAT button are pushed.

START/CUT BUTTON

When this button is depressed, the power is turned on for the turntable, the strobe light comes on and the platter starts to rotate. With the RECORD SIZE SELECTOR set at one of the positions – 30, 25, or 17 – the tonearm moves automatically to the record disc as the platter starts rotation, thus starting record playing.

If this button is depressed while the record is playing, the tonearm automatically returns to the arm rest, and the power to the turntable will be cut off.

REPEAT BUTTON

Push this button when you want to listen to the same record again. Press the button once more to release.

NOTE:
All you have to do for repeat play is to press the REPEAT button. There is no need to push the START/CUT button again.

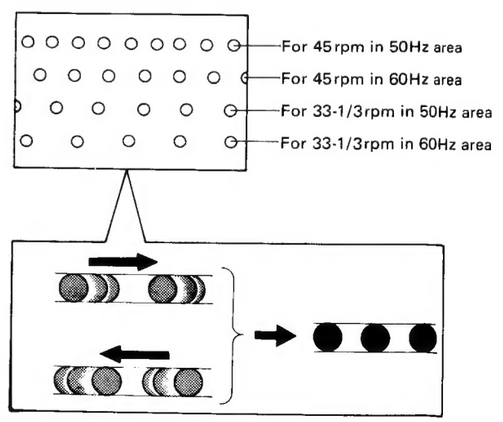
PLATTER/PLATTER MAT

When the tonearm is moved and power is supplied to the turntable, the platter will start rotating at the set rotation speed.

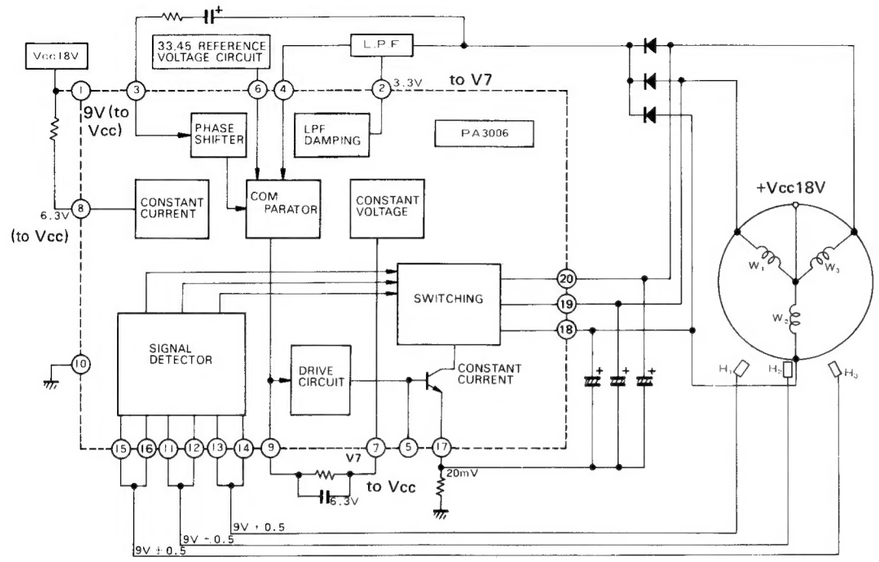
The platter mat stabilizes the records and also absorbs external vibration.

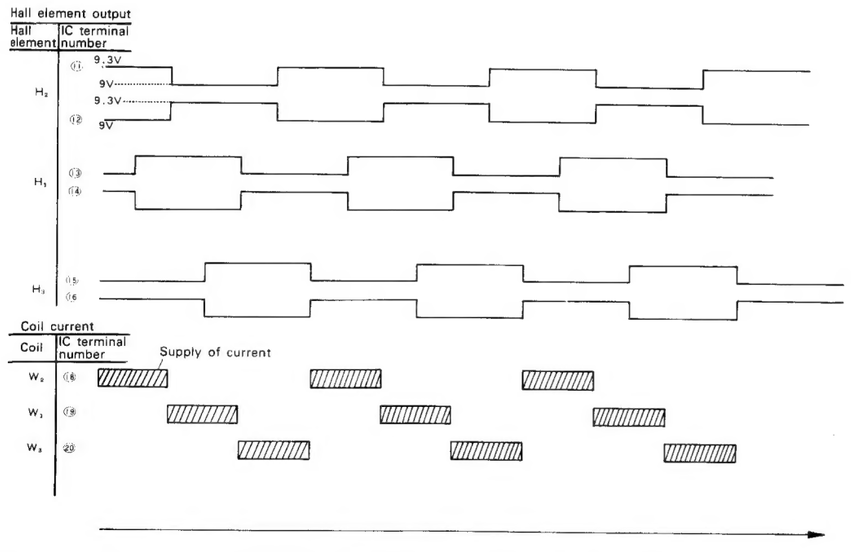
ADJUSTING THE SPEED OF PLATTER

1. Observe the stroboscope through the speed checking window. Four different pitches of the markings are used in the stroboscope. The pitch varies with the power line frequency and the rotating speed of the platter, as shown.
2. Make sure one of the four types of stroboscope markings is set according to the line frequency and the platter speed, and turn the SPEED ADJUSTMENT knob as instructed in the following to make adjustment.
   - When markings appear to stand still: The platter is turning at the rated speed (33-1/3 or 45rpm), and no adjustment is required.
   - When markings appear to move rightwards: The speed of the platter is lower than the rated speed. Turn the knob clockwise until markings appear to stand still.
   - When markings appear to move leftwards: The speed of the platter is higher than the rated speed. Turn the knob counterclockwise until the markings appear to stand still.



3. BLOCK DIAGRAM (IC = PA3006)





DD Motor Operation

The control circuit employed in the PL-3000 turntable is an IC version of the control circuit in the PXM-030 D.D motor turntable. Operation is basically the same, and has already been described in the "Additional Service Manual" (ART-292) for the PXM-030.

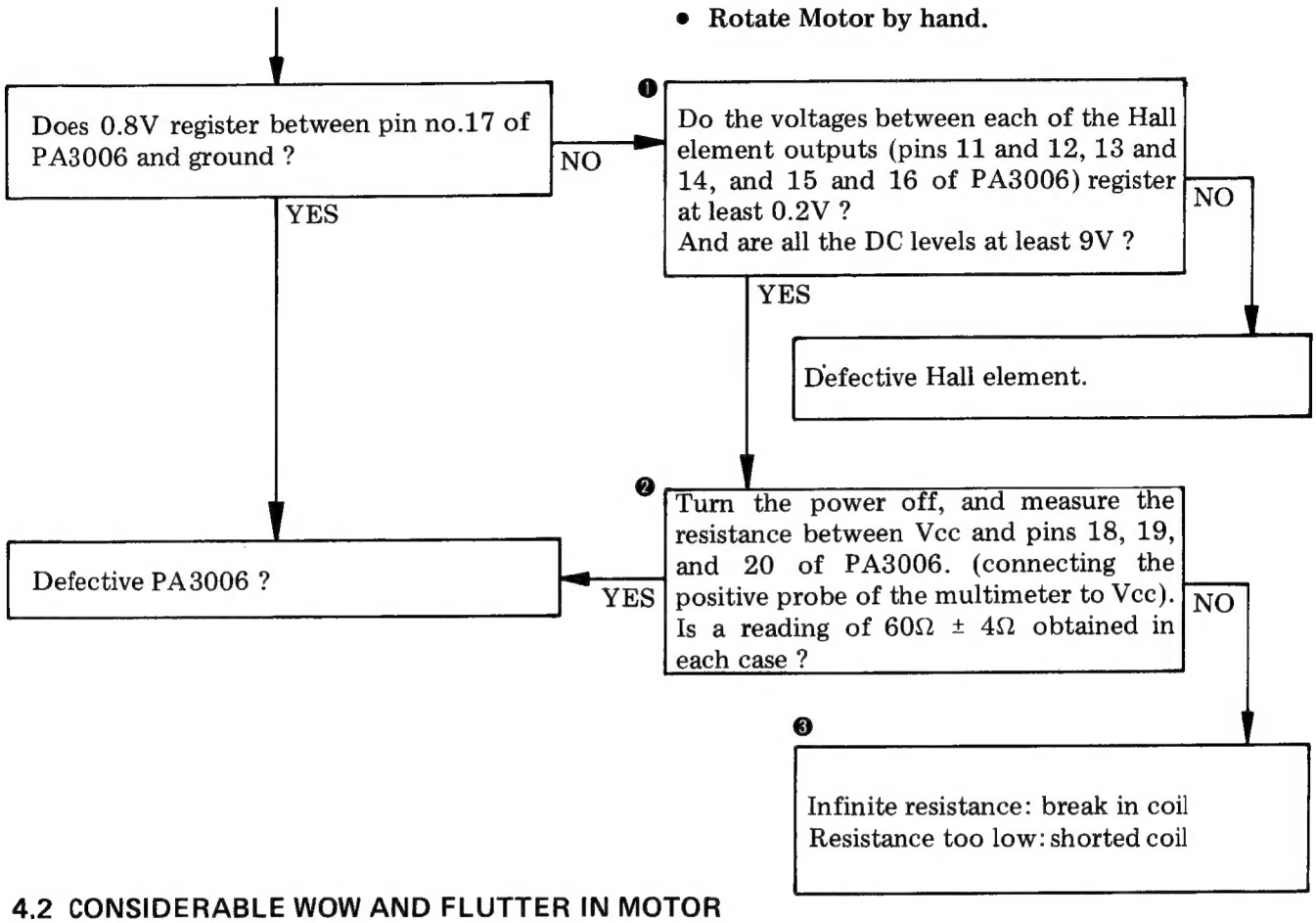
Position Detector Hall Element Output and Coil Current

4. D.D MOTOR TROUBLE SHOOTING CHART

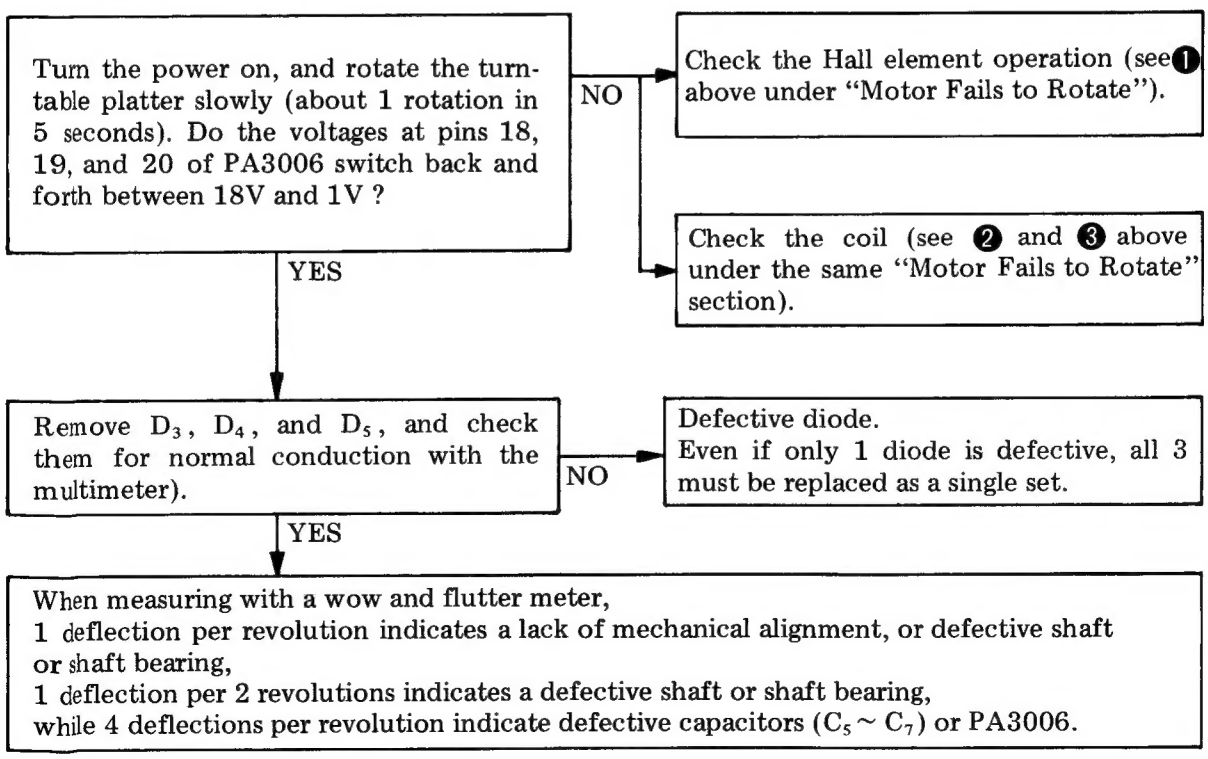
4.1 MOTOR FAILS TO ROTATE

- Does 18V register between Q_2 emitter and ground ?
  - NO → Defective Q_1, Q_2, D_6 or other circuit components in the power supply stage.
  - YES ↓
- Check that external connections are normal (including pitch VRs and motor connector plug).
  - YES ↓
- Does 6.3V (to Vcc) register at pin no.7 of PA3006 ?
  - NO → Defective PA3006.
  - YES ↓
- Does the voltage across pins 6 and 7 of PA3006 register 3.4V for 33 rpm, and 3.6V for 45 rpm ?
  - NO → Are the same voltage readings obtained when measuring after disconnecting terminal no.12 of the printed circuit board ?
    - NO → Defect in the reference bias circuit consisting of $R_1 \sim R_7$, VR_1, VR_2, D_1 and D_2.
    - NO ↓ → Defective PA3006.
  - YES ↓
- Does the voltage across pins 4 and 7 of PA3006 register 2.9V ? (Connect the positive probe of the multimeter to pin no.4 , and the negative probe to pin no.7).
  - NO → Defect in the speed detector circuit consisting of $R_9 \sim R_{11}$, C_2, C_3, and $D_3 \sim D_5$.
  - YES ↓
- Does the voltage across pins 7 and 9 of PA3006 register about 1V ? (Connect positive probe to pin no.9, and negative probe to pin no.7).
  - NO → Deffective PA3006.
  - YES ↓

- Includes motor dead point

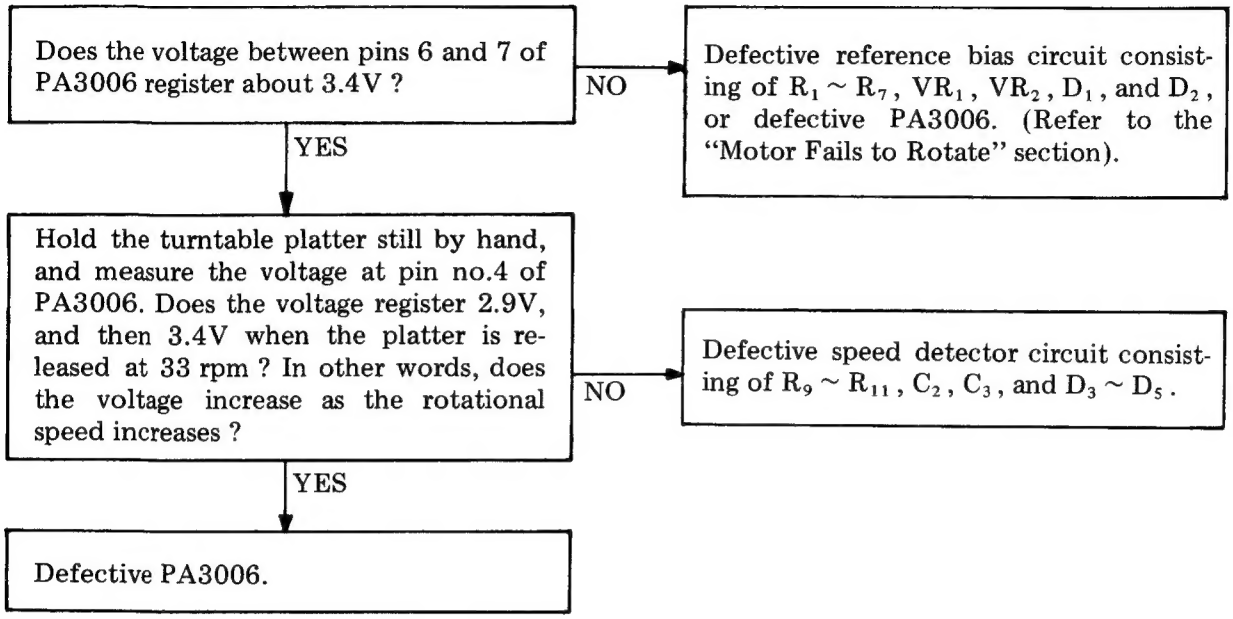


4.2 CONSIDERABLE WOW AND FLUTTER IN MOTOR



4.3 MOTOR RUNAWAY

Check power supply voltage and wiring connections.



4.4 ROTATIONAL SPEED ADJUSTMENT

If correct speed cannot be attained by adjusting the pitch controls, adjust the motor in the following way.

1. Set the pitch controls to the center positions.
2. Turn the power on, and adjust VR_1 and VR_2 in turn to obtain accurate rotational speeds at 45 rpm and 33-1/3 rpm respectively (i.e. when stroboscope appears to be stationary).

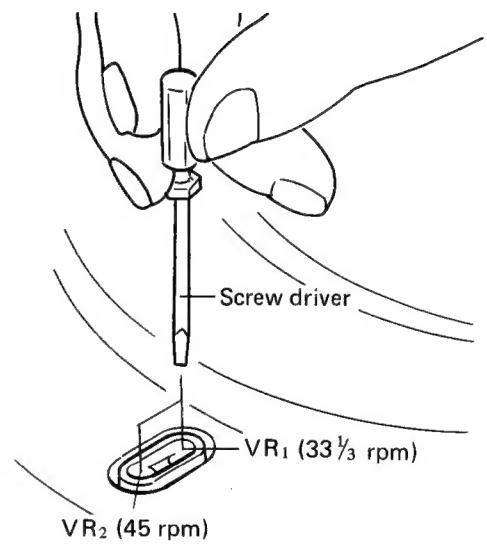


Fig. 1

5. OPERATION AND ADJUSTMENT OF TURNTABLE DRIVE MECHANISM

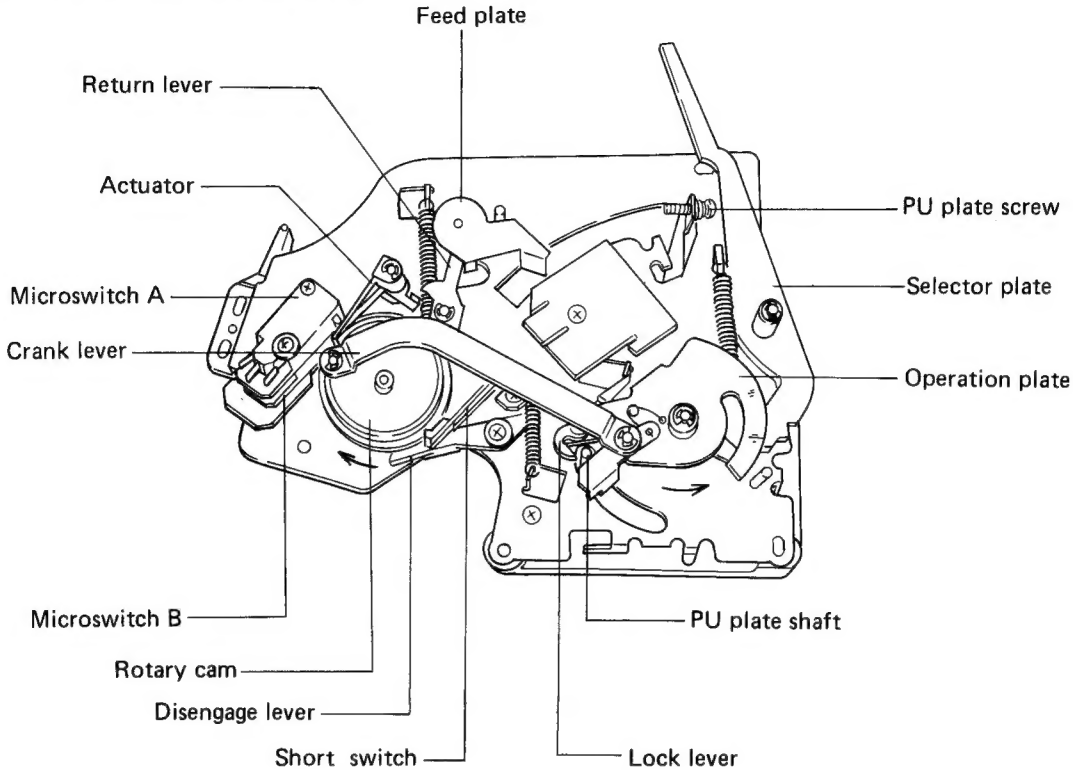


Fig. 2 Drive mechanism when stationary

5.1 AUTO LEAD IN

When the START or REPEAT button is pressed, power is applied to the Timing motor, and the rotary cam commences to rotate. By the time this cam has made half a turn (commencement of record play), the following operations will have been completed.

1. When the cam commences to rotate, microswitch A is turned on to start up the DD motor.
2. The crank lever coupled to the cam rotates the operation plate.
3. The start lever commences to move at the same time as the operation plate, resulting in the lock lever engaging the PU plate shaft (see Fig. 3-a).
4. As the cam rotates further, the lock lever together with the start lever moves the tonearm across to the position determined by the selector plate.
5. The start lever stops when it meets the selector plate (see Fig. 3-b A point).
6. Although the start lever stops, the operation plate continues to rotate, consequently releasing the lock lever from the PU plate shaft (the lock lever being pushed out by contact with the operation plate at point B).
7. As the operation plate continues to rotate, the tonearm elevation is lowered until the stylus lands on the record surface (see Fig. 5).

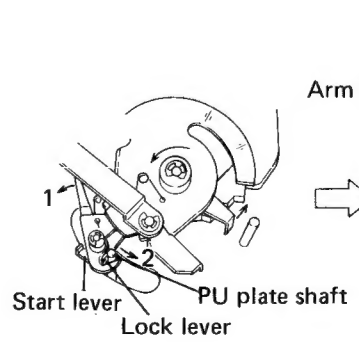


Fig. 3-a

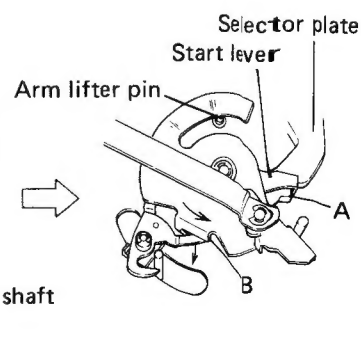


Fig. 3-b

8. As soon as this lowering operation is completed, the cam will have completed exactly half a turn. Since the actuator drops into the concave section of the cam, microswitch B (base) is turned off to stop the Timing motor.
9. At the same time that the Timing motor is turned off, the switch shorting the cartridge output terminal is turned off (thereby disconnecting the muting circuit).
10. As the record commences to rotate, the tonearm is drawn across to the center of the record (Fig. 5).

5.2 AUTO-RETURN

1. As the tonearm approaches the lead-out groove of the record, PU plate screw presses against the feed plate, thereby moving the stopper towards the center shaft (see Fig. 6).
2. Once the stopper snaps back by the pin attached to the motor, microswitch B (lower side) is turned on by the return lever, resulting in power being applied to the Timing motor (see Fig. 6).
   Nos. ❶ to ⑩ in Fig. 6 indicate the sequence of events up until the Timing motor commences to rotate.
3. The cam rotating together with the Timing motor also rotates the operation plate via the crank lever, the cartridge output being shorted during this rotational operation by the short switch.
4. Rotation of the operation plate activates the arm lifter, thereby lifting the tonearm away from the record.
5. The return lever on the operation plate then commences to return the PU plate shaft in order to return the tonearm to the arm rest (see Fig. 7).
6. After the tonearm has been returned to the arm rest, the rotating cam switches off the power to the main motor, and to all other parts of the PL-3000 (microswitch A is turned off when the upper side of the actuator drops into the concave section of the cam).

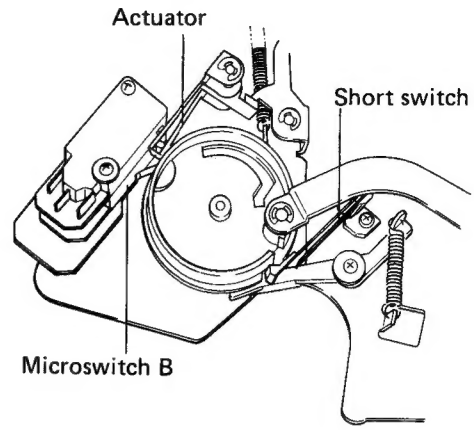


Fig. 4

Fig. 5

Fig. 4, Fig. 5 Drive mechanism during record play (Cam rotated half a turn)

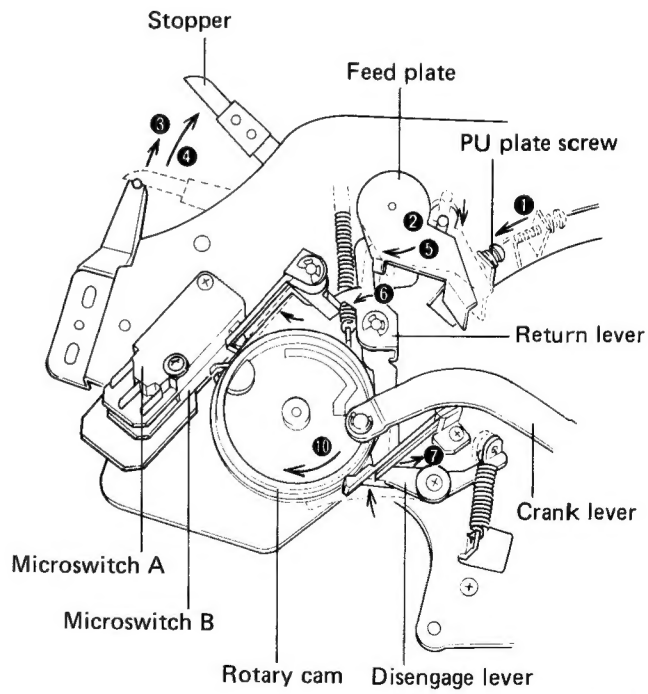


Fig. 6

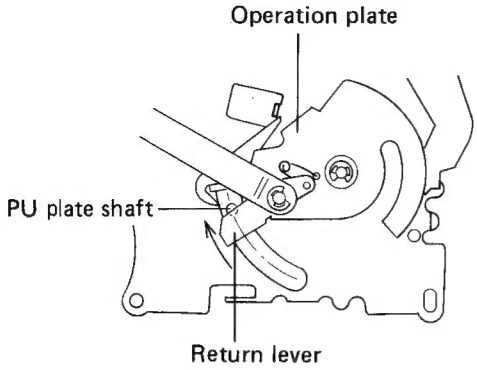


Fig. 7

5.3 MANUAL OPERATION

- **Start by pressing START button first**

1. Set the RECORD SIZE SELECTOR to the MANUAL position.
2. When the START button is then pressed, and the Timing motor commences to rotate, the operation plate will also commence to rotate, resulting in the lock lever together with start lever holding the PU plate shaft.
3. In the same position that the PU plate shaft is held, the start lever meets the claw of the selector plate, and consequently stops.
   After the operation plate rotates a little further, the operation plate shaft separates the lock lever from the PU plate shaft.
4. As the operation plate continues to rotate, the elevation pin drops down when the sloped portion of the plate is met. The Timing motor subsequently stops when the operation plate is pushed round as far as it will go.
5. Raise the tonearm by hand, and lower the stylus onto the record to commence play.
   The return operation in this case is the same as described above under section 5.2.

- **Start by first moving tonearm across to the record**

First lift the tonearm and move it across to above the record, and then press the START button. The Timing motor will commence to rotate, and operation plate will start to move, resulting in the tonearm being lowered in the same way as described before.

5.4 AUTO-CUT

When the CUT button is pressed, power is applied to the Timing motor, resulting in the same sequence of events as described in steps 3 to 6 under section 5.2.

5.5 ADJUSTMENTS

Prior to commencing any adjustments, check that the PU plate shaft moves along the center axis of the slot in the sub-panel as shown in Fig. 8.

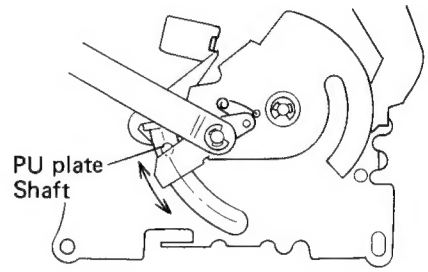


Fig. 8

- **Tonearm lowering position**

Tonearm lowering position is adjusted by turning an adjustment screw located in the hole at the base of the tonearm (see Fig. 9).

Turn the screw clockwise to move the lowering position inwards.

Turn the screw counterclockwise to move the lowering position outwards.

This adjustment may be simplified by using a test record .

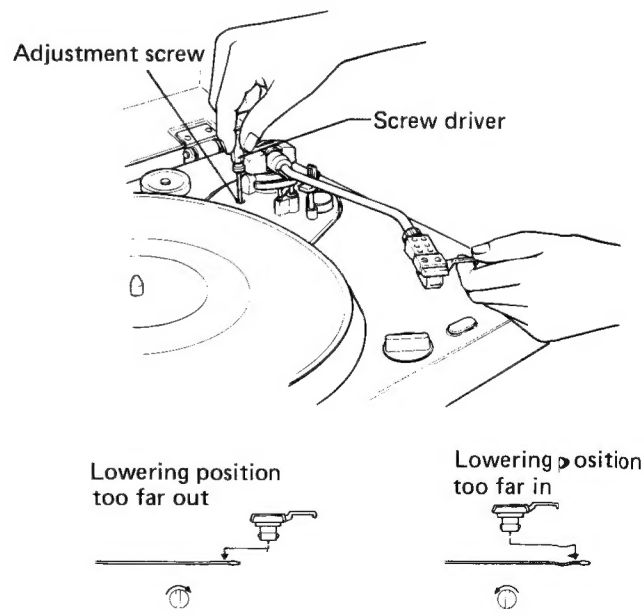


Fig. 9

- **Auto-return position**

1. If the tonearm returns too early, screw the PU plate screw outwards (see Fig. 10).
2. If the tonearm returns too slow, screw the PU plate screw inwards.

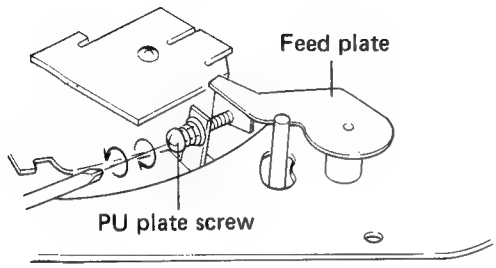


Fig. 10

- **Tonearm misoperation**

If the tonearm should happen to stop midway during the lead-in operation, adjust the nut shown in Fig. 11.

Note:
This nut should be neither too tight, nor too loose.

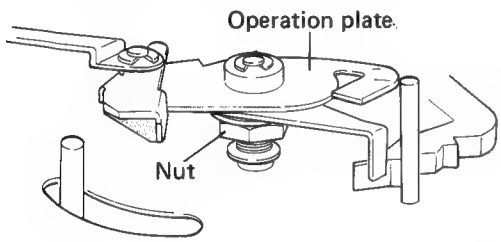


Fig. 11

- **Short switch**

The short switch gap should be 0.5mm during record play. This gap may be adjusted by the screw shown in Fig. 12 below.

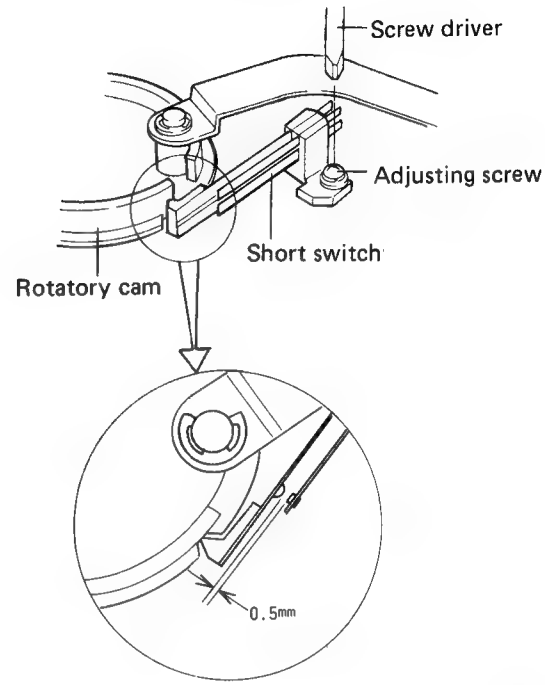


Fig. 12

6. DISASSEMBLY

6.1 BASE AND PANEL

1. First remove the top cover by undoing the 4 securing screws ❶.
2. Then disconnect the connector ❷ plugged into the printed circuit board.
3. And disconnect the connector ❸ plugged into the motor.
4. Next undo the screws ❹ securing the 4 insulators.
5. Lie the tonearm over towards the center, and carefully lift the panel up and off.

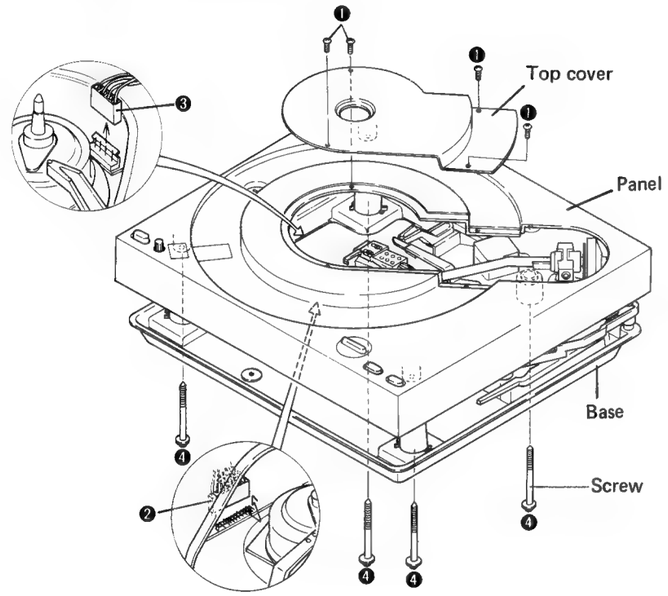


Fig. 13

6.2 MOTOR

1. First remove the panel as described above under section 6.1.
2. Then undo the 3 screws ❶ securing the motor.

6.3 SUB-PANEL ASSEMBLY AND TONEARM BASE (Fig. 15)

1. First remove the panel as described above under section 6.1.
2. Then undo the 3 screws ❶ securing the tonearm base and the sub-panel assembly.
3. Use a soldering iron to disconnect the tonearm lead wires.
4. Undo the 2 screws ❷ (located underneath the sub-panel assembly) securing the tonearm base to the sub-panel assembly.

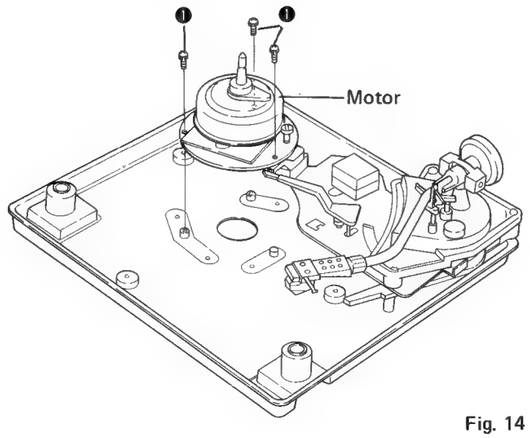


Fig. 14

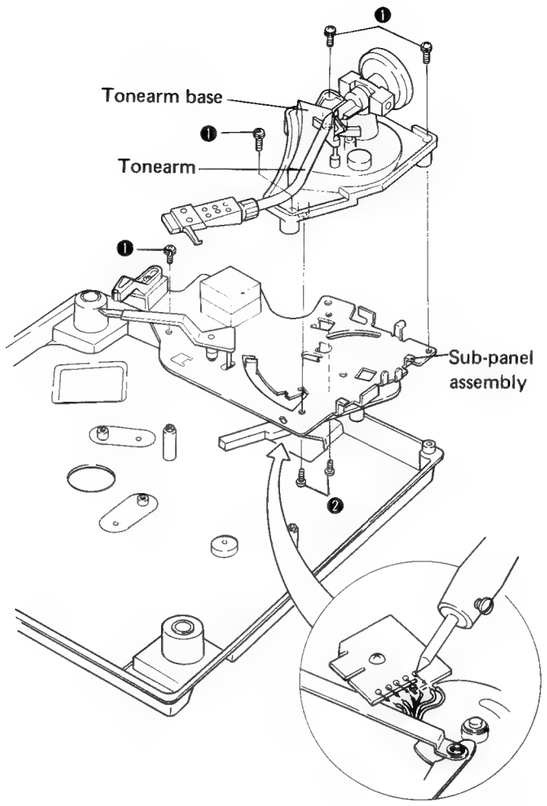


Fig. 15

6.4 TONEARM (Fig. 16)

1. First separate the tonearm base from the sub-panel assembly as described above under section 6.3.
2. Use a hexagonal wrench to loosen the 2 screws ❶. Then remove the PU plate assembly.
3. Use the same hexagonal wrench to loosen screw ❷, and lift the tonearm out from the tonearm base.

6.5 PUSH-BUTTON UNIT (Fig. 17)

1. First remove the panel as described above under section 6.1.
2. Pull the RECORD SIZE SELECTOR ❶ up and out.
3. Undo the 3 screws ❷ securing the control base unit.
4. Then undo the 2 screws ❸ securing the push-button unit.

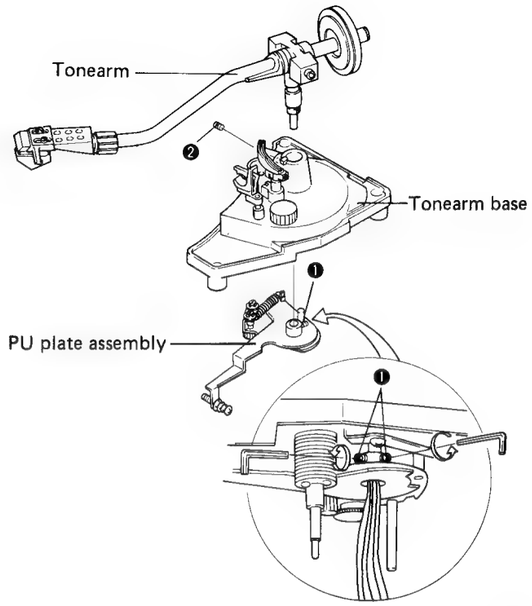


Fig. 16

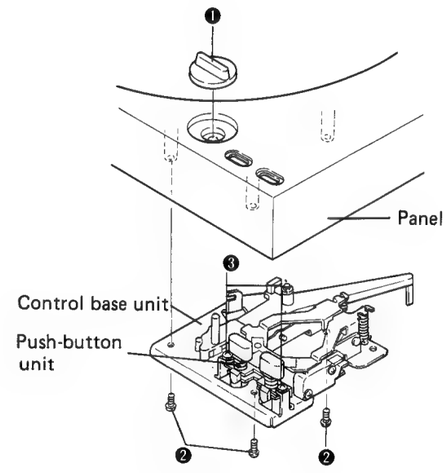
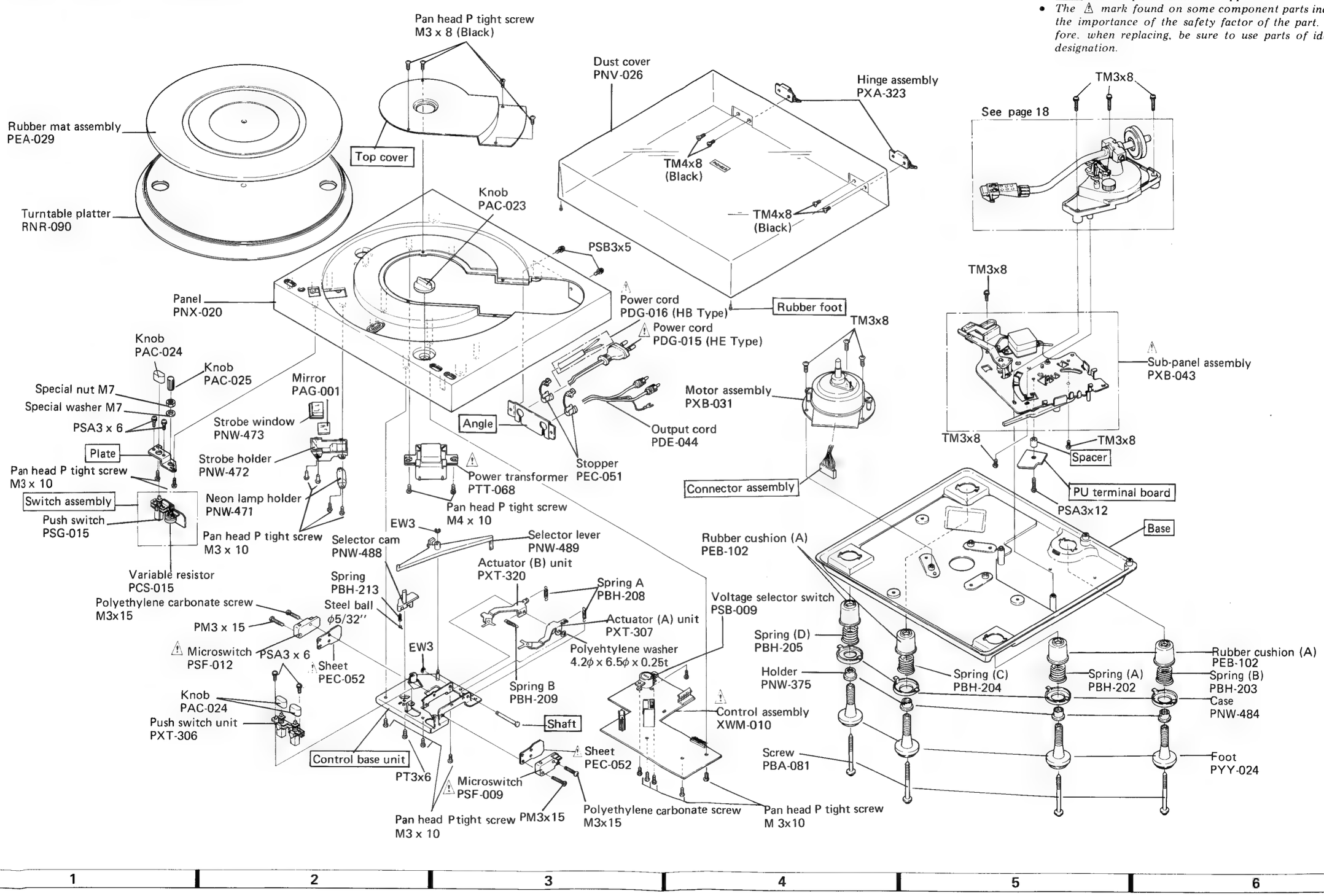


Fig. 17

7. EXPLODED VIEWS

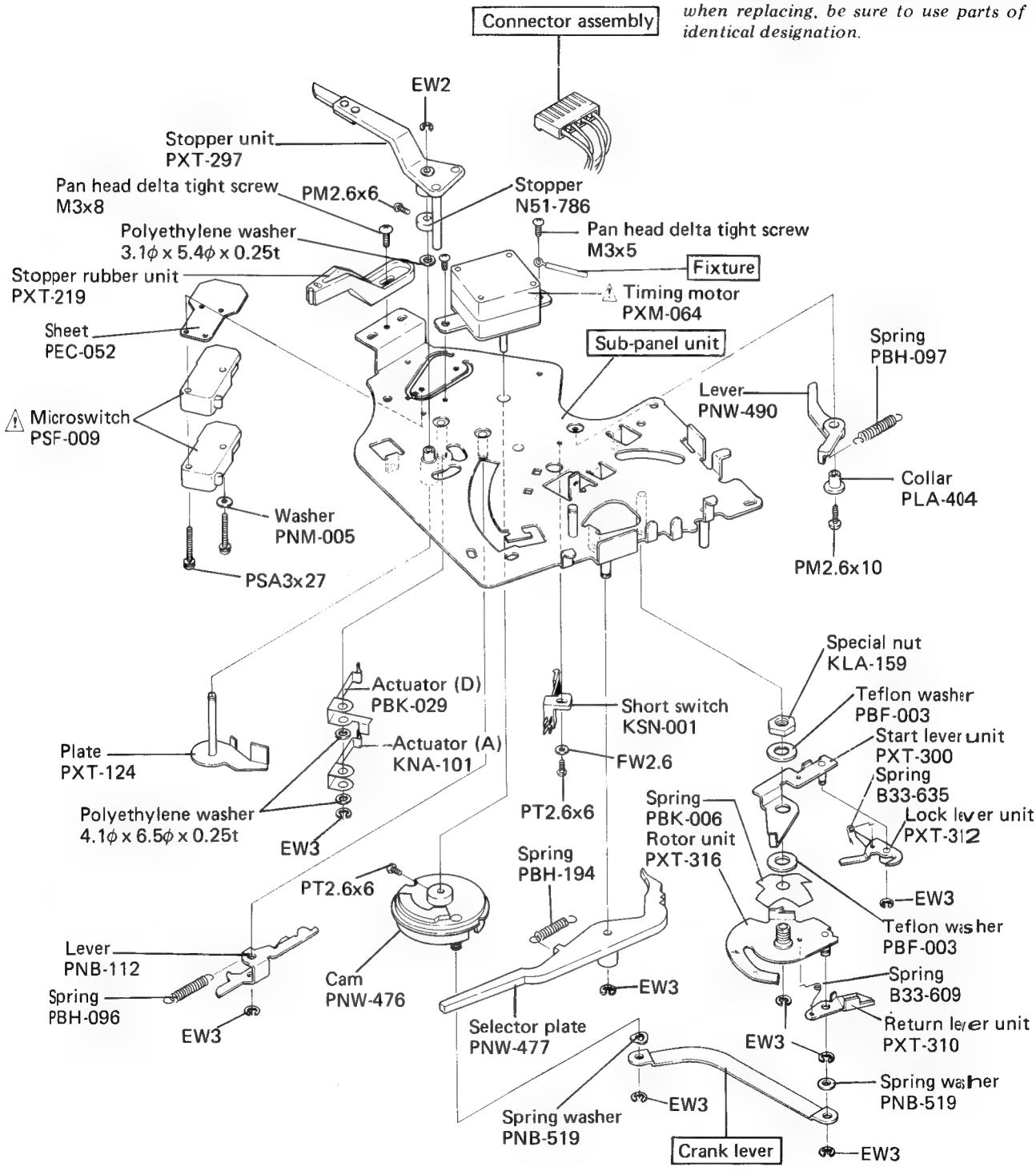
NOTES:

- ☐ *marked parts cannot be supplied.*
- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*



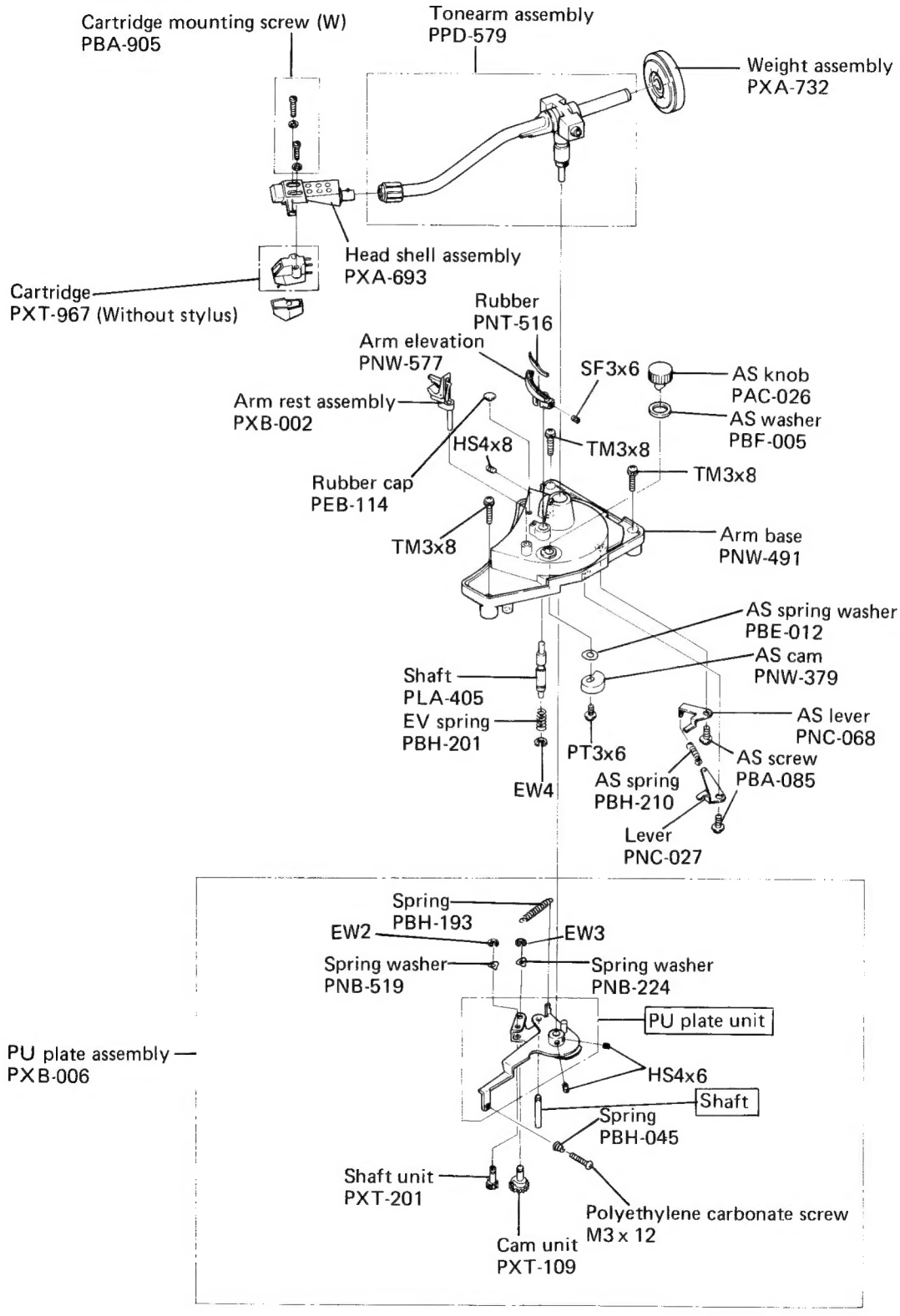
7.1 SUB-PANEL ASSEMBLY (PXB-043)

NOTES:
- ☐ *marked parts cannot be supplied.*
- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*



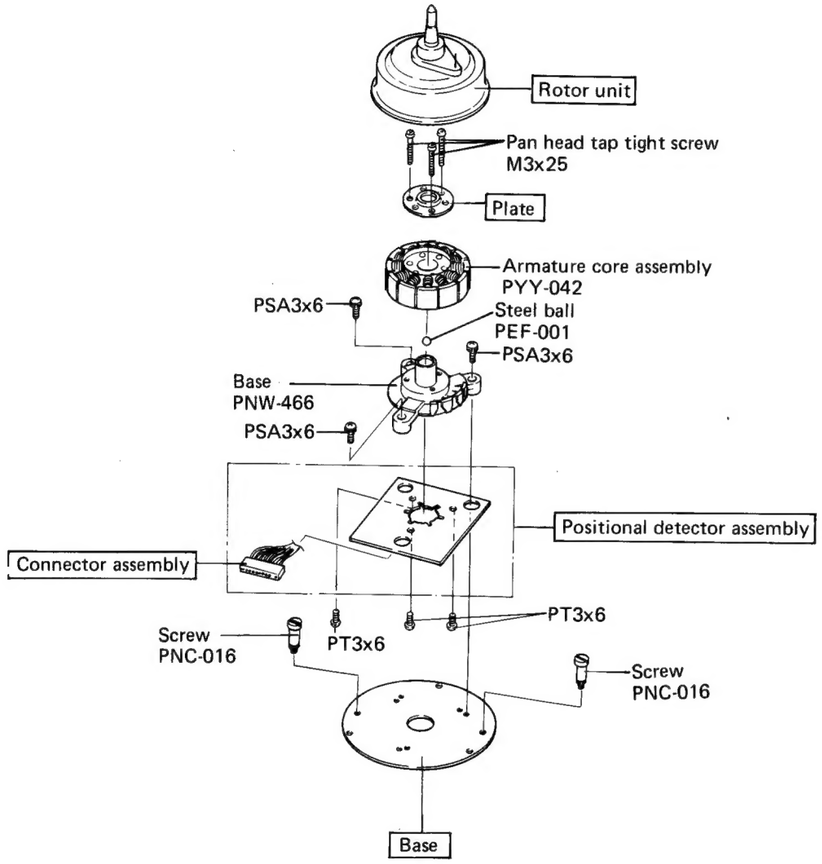
7.2 TONEARM

NOTE:
marked parts cannot be supplied.

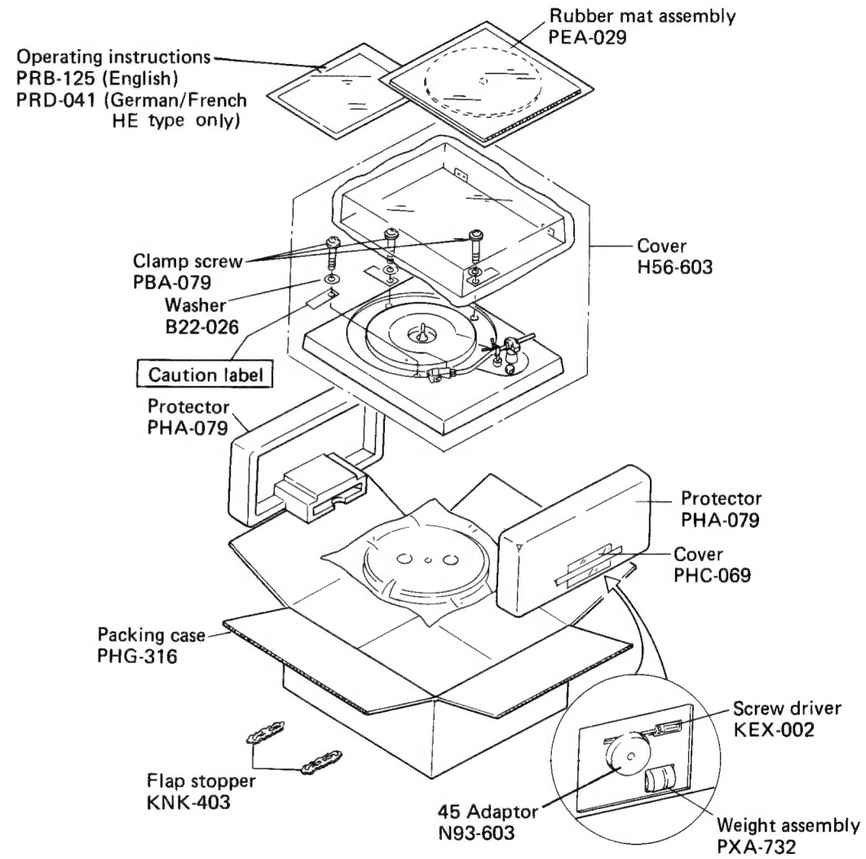


7.3 MOTOR ASSEMBLY (PXB-031)

NOTE:
□ *marked parts cannot be supplied.*

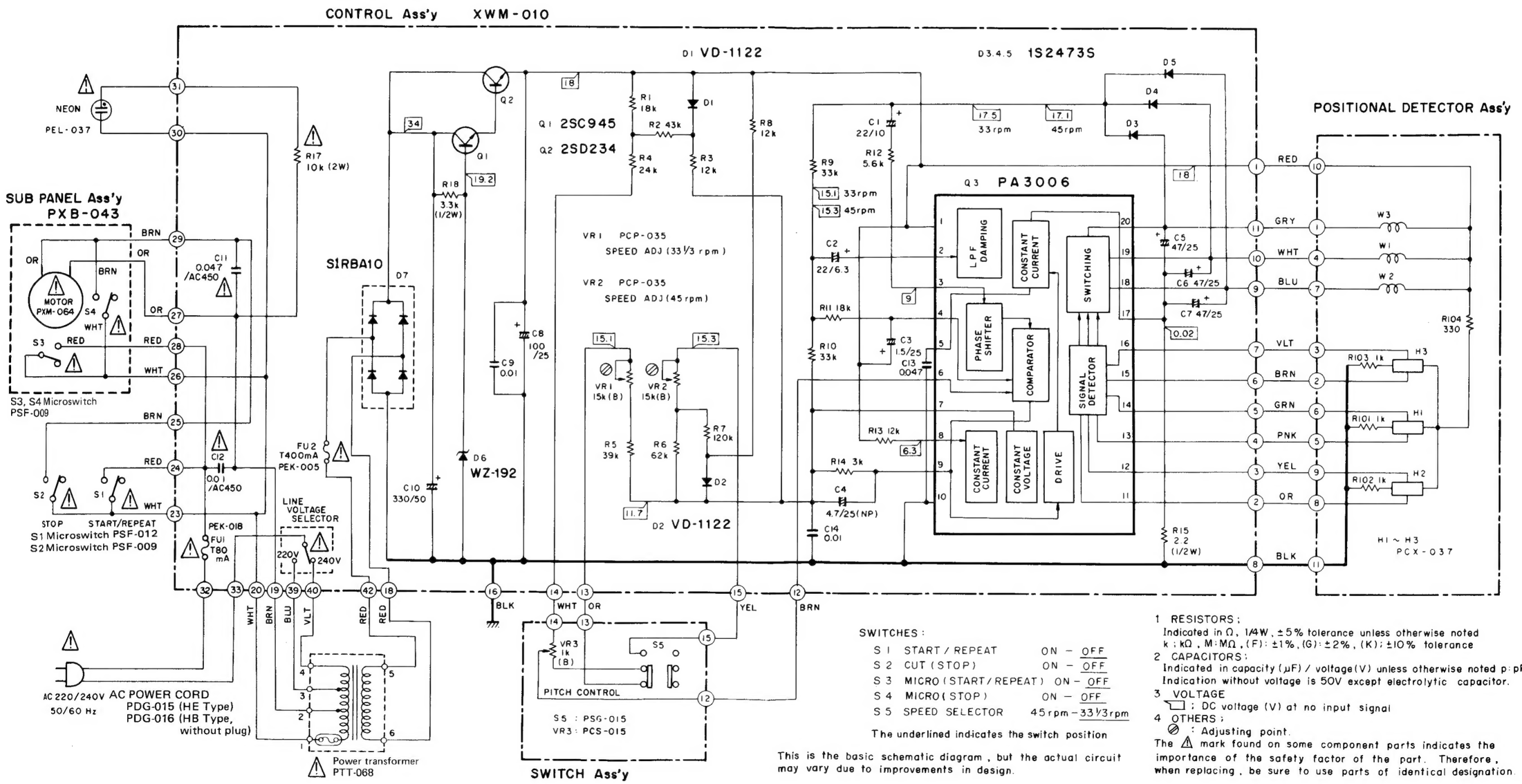


8. PACKING



9. SCHEMATIC DIAGRAM, P.C. BOARD PATTERNS AND PARTS LIST

9.1 SCHEMATIC DIAGRAM



SWITCHES :

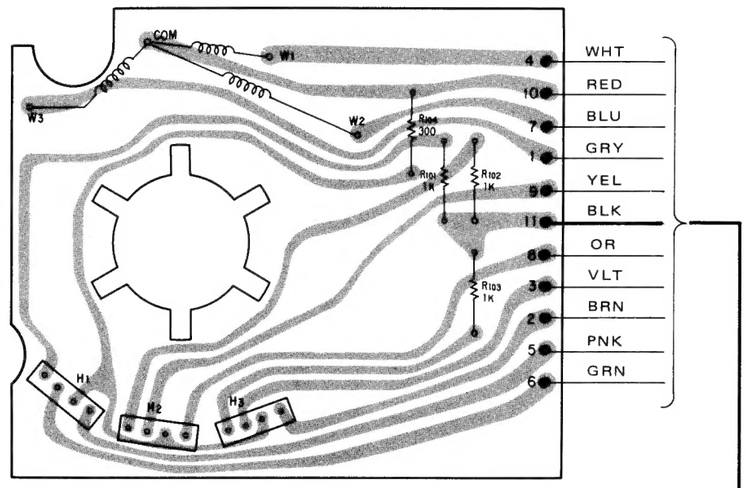
S 1	START / REPEAT	ON – OFF
S 2	CUT (STOP)	ON – OFF
S 3	MICRO (START/REPEAT)	ON – OFF
S 4	MICRO (STOP)	ON – OFF
S 5	SPEED SELECTOR	45rpm – 33 1/3rpm

The underlined indicates the switch position

This is the basic schematic diagram , but the actual circuit may vary due to improvements in design.

1 RESISTORS ;
Indicated in Ω, 1/4W, ±5% tolerance unless otherwise noted
k ; kΩ , M : MΩ , (F) : ±1%, (G) : ±2%, (K) ; ±10% tolerance
2 CAPACITORS ;
Indicated in capacity (μF) / voltage (V) unless otherwise noted p : pF
Indication without voltage is 50V except electrolytic capacitor.
3 VOLTAGE
□ ; DC voltage (V) at no input signal
4 OTHERS ;
⊘ : Adjusting point.
The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore , when replacing , be sure to use parts of identical designation.

9.2 P. C. BOARD CONNECTION DIAGRAM



POSITIONAL DETECTOR Ass'y